Calendar No. 285

101ST CONGRESS *1st Session*	SENATE	REPORT 101-158

EARTHQUAKE HAZARDS REDUCTION ACT OF 1977 AMENDMENTS ACT

REPORT

OF THE

SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ON

S. 1062

OCTOBER 3 (legislative day, SEPTEMBER 18), 1989.—Ordered to be printed

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Mr. HOLLINGS, from the Committee on Commerce, Science, and Transportation, submitted the following

REPORT

[To accompany S. 1062]

The Committee on Commerce, Science, and Transportation, to which was referred the bill (S. 1062) to amend the Earthquake Hazards Reduction Act of 1977 to improve the Federal effort to reduce earthquake hazards, and for other purposes, having considered the same, reports favorably thereon with an amendment in the nature of a substitute and recommends that the bill do pass.

PURPOSE OF THE BILL

The primary objective of the legislation is to revise and broaden the scope of the National Earthquake Hazards Reduction Program (NEHRP) in order to improve the Nation's earthquake preparedness. In addition, the bill modifies the role played by the Federal Emergency Management Agency (FEMA) as lead agency for the NEHRP and establishes a Center for the International Exchange of Earthquake Information at the United States Geological Survey (USGS) in order to foster international sharing of information on earthquakes and earthquake preparedness.

BACKGROUND AND NEEDS

Earthquakes are among the most devastating of all natural hazards. As illustrated by recent earthquakes in Armenia and Mexico, in a few minutes, a single earthquake can kill tens of thousands of people without warning. In the United States, earthquakes pose a large threat to California, Alaska, and other parts of the western United States. In 1906, an earthquake with a magnitude 8 on the

Richter scale killed over 700 people and destroyed much of San Francisco. A similar earthquake today would cause 3,000 to 11,000 deaths, and tens of thousands of serious injuries, and result in tens of billions of dollars in property damage and other economic loss.

However, damaging earthquakes are not restricted to the Western United States. Recent research indicates that in the last 235 years, the central and eastern United States have experienced earthquakes as large or larger than the Armenian earthquake, and that such earthquakes will occur in the future. The late Dr. Robert Ketter, former Director of the National Center for Earthquake Engineering Research, testified that the probability of a destructive earthquake in the eastern and central United States before the year 2010 is nearly 100 percent.

HISTORY OF THE NEHRP

To address this national problem, the Committee played a major role in the enactment of the Earthquake Hazards Reduction Act of 1977, the statute that created the NEHRP. The purpose of the Act is to coordinate earthquake research and to improve earthquake preparedness. Four principal agencies are involved in the NEHRP—FEMA, USGS, the National Science Foundation (NSF), and the National Institute of Standards and Technology (NIST). FEMA is responsible for helping the States prepare for and respond to major earthquakes. USGS, as the Nation's principal geological agency, assesses seismic risks throughout the country, assists State and local officials in identifying the most dangerous areas, and monitors and investigates earthquakes. NSF, as part of its mission to support to basic scientific and engineering research in universities, supports academic investigators in both geology and earthquake engineering. NIST's Center for Building Technology investigates the properties and behavior of construction materials, including their resistance to seismic activity.

In addition, in 1980 Congress gave FEMA a second responsibility, the job of coordinating the overall program. FEMA is to recommend to the President roles and responsibilities of the appropriate Federal agencies, compile and maintain a program plan for the NEHRP, report to Congress on NEHRP activities, and generally develop an overall strategy for the program.

In addition to the four principal agencies, several other agencies, including the Departments of Defense, Commerce, and Energy, the National Aeronautics and Space Administration, and the Nuclear Regulatory Commission, participate in NEHRP activities, especially those regarding seismic safety in construction.

CONCERNS ABOUT THE PROGRAM

The Committee has strongly supported the NEHRP, and in 1988 passed a three-year bill (Public Law 100–252) which authorized a 16 percent increase in funding from fiscal year 1988 to fiscal year 1990. The NEHRP has made major strides, particularly in research related to building safety and the identification of those areas of the United States most prone to seismic damage.

However, in recent years, concerns have grown within the earthquake community about four problems with the NEHRP: (1) the

continuing erosion of appropriations levels (in real dollars) for the program, (2) the slow and, in the view of many experts, inadequate application of research findings to earthquake preparedness, (3) the need for improved leadership and coordination of the agencies in the program, and (4) the need to ensure the seismic safety of Federal buildings.

Funding levels.—Since the NEHRP was established in the late 1970s, funding for its activities has shrunk about 40 percent in real dollars (See Table 1 from "The National Earthquake Hazards Reduction Program," a Congressional Research Service Report to Congress, August 9, 1989). Much valuable research has been done despite the reduced funding, but the cuts have taken a toll. Regional seismic networks, which provide important information on earthquakes in the central and eastern States, have faced major cutbacks. Earthquake engineering programs to develop safer buildings and other structures have been reduced and existing research facilities have been underutilized. Some excellent earthquake researchers have left the field.

These funding problems have led to calls for both a more effective, coordinated use of existing NEHRP funds and the development of a more effective strategy for future program activities.

TABLE 1.—FUNDING FOR THE NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM

[In thousands of fiscal year 1989 dollars]

	FEMA	USGS	NSF	NIST	Total
1978		53,329	40,763	273	94,365
1979		51,332	36,392	526	88,250
1980		47,855	37,039	551	85,445
1981	1,222	44,717	32,315	692	78,947
1982	1,225	41,754	32,272	625	75,877
1983	4,215	42,427	30,355	664	77,663
1984	4,542	41,607	29,361	596	76,107
1985	7,022	41,581	28,894	568	78,067
1986	5,990	37,832	25,014	569	69,406
1987	6,198	37,303	26,925	573	71,001
1988	6,160	36,215	26,329	545	69,250
1989	6,074	34,688	24,700	525	65,987
1990 [1]	5,434	31,519	25,406	506	62,867

[1] President's budget request.

Application of research.—Concern also has grown that much of the scientific and engineering research that has been done under the NEHRP has not been effectively applied. Structural engineers often do not know about the latest research that the NEHRP has funded; data that would help insurance estimators better understand earthquake hazards is not always available in usable forms; and local zoning commissions are often not informed on the latest research findings. New efforts to improve applications are being made through NEHRP-assisted organizations such as the National Center for Earthquake Engineering Research (NCEER) in Buffalo, New York, and the Central U.S. Earthquake Consortium (CUSEC), but more could be done.

Funding reductions have exacerbated the transfer of research findings to those who help communities prepare for earthquakes, just when new research has found that the earthquake threat is

more serious than previously thought, especially in the eastern and central United States. FEMA has ongoing efforts to help communities prepare disaster plans in case of an earthquake, but little money has been available to help these localities improve building codes and zoning provisions and thus improve building safety. The safety of school buildings, fire stations, and hospitals remains a prime concern.

Leadership problems.—Many members of the earthquake preparedness community have expressed concerns about perceived weaknesses in the NEHRP's overall coordination and leadership. In December 1987, FEMA formed a committee of outside experts to evaluate the program. This "expert review panel" concluded that FEMA has failed to adequately coordinate and promote the program, although it has "strengthened its role as coordinator of the NEHRP in recent years. * * *" ("The National Earthquake Hazards Reduction Program—Commentary and Recommendations of the Expert Review Committee, 1987," FEMA) The panel made a clear distinction between FEMA's own internal program to help the States prepare for earthquakes and the agency's second responsibility to lead and coordinate the overall four-agency program. The panel focused on shortcomings in the second area. Only 23 people out of FEMA's staff of 2,000 perform earthquake-related activities, and only one of those is responsible for implementing FEMA's leadership role.

The expert review panel recommended the formation of an independent earthquake commission whose sole purpose would be to coordinate the four agencies in the NEHRP. The panel considered two other options: (1) strengthening FEMA's lead agency role, but only if FEMA "commits significant additional resources of manpower and money", and (2) replacing "FEMA as lead agency with USGS or NSF, because of the greater depth of expertise in, and the larger amounts of money appropriated to these agencies for, earthquake related activities." The expert review panel found all three options to be an improvement over the status quo, which it found "unacceptable."

Other observers, particularly officials from State emergency management agencies, have favored keeping FEMA as the program's lead agency.

Safety of Federal Buildings.—There is growing concern that many of the more than 400,000 buildings which the Federal Government owns or leases are not prepared for a major earthquake. In many cases, Federal buildings are less earthquake-resistant than nearby privately-owned buildings. There is particular concern that Federal hospitals and military bases might not survive a major earthquake and thus would be unable to provide critically-needed services and resources to earthquake victims. The collapse of a Veterans' Administration hospital in the 1971 San Fernando earthquake underscored this problem.

In 1978, the Interagency Committee on Seismic Safety in Construction (ICSSC) was established as part of the NEHRP so that Federal departments and agencies could work together to develop earthquake hazard reduction measures which each agency could implement. At present, 25 agencies are represented on the ICSSC,

including the General Services Administration, Department of Defense, and the Veterans' Administration.

For more than 10 years, the ICSSC has been developing seismic design guidelines for new and existing Federal buildings and facilities. In 1987, the ICSSC published "Seismic Design Guidelines for Federal Buildings" (ICSSC RP-1), which are intended primarily for new buildings. In March 1989, these were followed by "Guidelines for Identification and Mitigation of Seismically Hazardous Existing Federal Buildings" (ICSSC RP-3). In 1986, the ICSSC prepared a draft executive order on "Seismic Safety of Federal and Federally Assisted or Regulated Construction," which would require the systematic application of these guidelines or equivalent measures in the construction-related programs of Federal agencies.

This draft executive order has not been approved by the Office of Management and Budget, which has expressed concerns about implementation costs. The costs will vary from region to region due to variations in the threat posed by earthquakes. For most of the United States, designing and constructing a new building to meet existing NEHRP-recommended building code provisions would add less than one or two percent to the cost of the building. In many cases, there would be no additional costs. For existing buildings, the cost of seismic retrofitting (adding structural supports to an existing building to make it more earthquake-resistant) varies with the type of building and the degree of seismic resistance desired. For typical seismic retrofitting projects, costs are between $3 and $13 per square foot for existing buildings ("Typical Costs for Seismic Rehabilitation of Existing Buildings," FEMA, July 1988).

In general, it is difficult to develop a detailed cost estimate for improving the seismic safety of Federal buildings because the technology of seismic design and retrofitting of existing building is still evolving and costs are decreasing as architects and builders become more familiar with seismic design. However, many inexpensive steps, like securing light fixtures and bookshelves, could significantly reduce seismic risks posed by earthquakes.

Although it is difficult to assess the total cost, in terms of property loss, lost economic activity, and loss of life, resulting from building collapse during earthquakes, it is clear that a single earthquake could result in tens of billions of dollars of property damage and tens of thousands of deaths, mostly due to the collapse of buildings and other structures. Most of the death and destruction in the recent Armenian earthquake would have been avoided if seismic construction practices like those required in California had been practiced.

Legislative History

On March 16, 1989, Senator Cranston introduced S. 629, cosponsored by Senators Hollings, Gore, and Wilson. The bill would make the USGS the lead agency for the NEHRP, provide improved interagency coordination, and update the focus of the program to reflect our improved understanding of earthquakes.

On April 7, 1989, the Subcommittee on Science, Technology, and Space held a hearing on S. 629 and on the threat posed by eastern and central United States earthquakes. Witnesses at the hearing

included Senator Cranston, an earthquake engineer, a State emergency manager, the head of the NEHRP expert review panel, and the Directors of FEMA and the USGS. Witnesses testified that the NEHRP was badly underfunded and recommended that more be done to utilize the research that has been funded by the NEHRP, particularly to build more earthquake-resistant buildings and to better alert the public to the hazards posed by earthquakes.

In response to testimony at the hearing, Senators Gore and Danforth introduced S. 1062 on May 18 in order to redirect the NEHRP and emphasize the need to apply the research that has been done on earthquakes and earthquake engineering. At its August 1 executive session, the Commerce Committee considered in open session an amendment in the form of a substitute for S. 1062 which contained the key provisions of S. 629. It was offered by Senator Gore and cosponsored by Senators Danforth and Hollings. The Committee approved an amendment to the substitute, offered by Senator Inouye, to retain FEMA as lead agency, in part due to assurances by FEMA that the earthquake program will receive more attention and resources in the future.

Summary of Major Provisions

S. 1062 amends the Earthquake Hazards Reduction Act of 1977, which created the NEHRP. The major provisions would:

1. Modify FEMA's role as lead agency for the NEHRP to provide for better interagency coordination. As lead agency, FEMA would work with the other agencies in the program to determine goals, priorities, and timetables for the program.
2. Amend the research section of the bill to emphasize the need for more applied research and acceleration of efforts to apply earthquake research.
3. Improve earthquake hazards mitigation efforts through better land-use plans, building codes, and earthquake response plans. The President shall adopt seismic design and construction standards for Federal buildings and facilities by June 1, 1993.
4. Place additional emphasis on public education about earthquakes, through regional clearinghouses and public-private programs.
5. Establish a Center for the International Exchange of Earthquake Information at the USGS.

Estimated Costs

In accordance with paragraph 11(a) of rule XXVI of the Standing Rules of the Senate and section 403 of the Congressional Budget Act of 1974, the Committee provides the following cost estimate, prepared by the Congressional Budget Office:

September 6, 1989.

Hon. Ernest F. Hollings,
Chairman, Committee on Commerce, Science, and Transportation, U.S. Senate, Washington, DC.

Dear Mr. Chairman: The Congressional Budget Office has reviewed S. 1062, the Earthquake Hazards Reduction Act of 1977

Amendments Act, as ordered reported by the Senate Committee on Commerce, Science, and Transportation, August 1, 1989.

Based on information provided by the U.S. Geological Survey, CBO estimates that enacting this bill would result in no significant costs to the federal government. S. 1062 would make a number of changes to programs under the act, such as specifying new research priorities and public education activities. The bill would not change the existing authorization for fiscal year 1990, and we do not expect that implementing these changes would require a significant amount of additional resources.

Enactment of this bill would not affect the budgets of state or local governments.

If you wish further details on this estimate, we will be pleased to provide them. The CBO staff contact is Michael Sieverts.

Sincerely,

ROBERT D. REISCHAUER,
Director.

REGULATORY IMPACT STATEMENT

In accordance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee provides the following evaluation of the regulatory impact of the legislation, as reported.

NUMBER OF PERSONS COVERED

This legislation updates the mission and activities of the Earthquake Hazards Reduction Act of 1977. It also requires that the President adopt seismic design and construction standards for new and existing Federal buildings and structures and for buildings and facilities involving Federal domestic assistance (including grants, loans, and mortgage insurance), leasing, and regulatory programs, which shall be developed by the Interagency Committee on Seismic Safety in Construction by June 1, 1993. The number of buildings and persons affected by these standards will depend upon their implementation.

ECONOMIC IMPACT

This legislation authorizes no new Federal spending. By providing for better interagency coordination of the NEHRP, it should improve the effeetiveness of monies now spent on earthquake research and earthquake preparedness. The adoption of Federal seismic design and construction standards could result in both increased building costs and significant savings due to the prevention of loss of life and property damage during earthquakes. The actual economic impact of the standards will depend upon their implementation.

PRIVACY

This legislation will not have any adverse impact on the personal privacy of the individuals involved.

PAPERWORK

This legislation requires the adoption of Federal seismic design and construction standards by June 1, 1993.

SECTION-BY-SECTION ANALYSIS

SECTION 1.—SHORT TITLE

This section provides the short title, the "Earthquake Hazards Reduction Act of 1977 Amendments Act."

SECTION 2.—FINDINGS

This section amends the findings section of the 1977 Act. Three new paragraphs are added, one on how the geological study of active faults is needed for long-term seismic risk assessments, one on the benefits of earthquake-resistant building practices, and one on the need for Federal Government buildings and facilities to be at least as earthquake-resistant as similar non-Federal buildings and facilities.

This section deletes two findings, one on the benefits of an accurate earthquake prediction system and one on the possibility of controlling or moderating earthquakes. The Committee notes that early hopes that NEHRP research would lead to fast and rapid improvements in earthquake prediction and earthquake control have not been realized. While significant progress has been made in identifying which areas of the country are subject to earthquakes and the approximate frequency of these events, no one can yet predict exactly when and where an earthquake will occur. Nor has any practical technology been developed yet that would allow one to prevent or moderate earthquakes.

As a result, the Committee believes that the emphasis in the 1977 Act and the NEHRP should shift from prediction and control of earthquakes to identifying seismic risks in specific parts of the country and in improving preparedness, particularly building safety and emergency response.

SECTION 3.—PROGRAM LEADERSHIP

This section, in further amending the 1977 Act makes minor modifications in the role of FEMA, the lead agency for the NEHRP, in order to improve FEMA's ability to lead the program effectively. The Director of FEMA is to recommend to the President roles for the agencies in the NEHRP, as well as goals, priorities, plans, and timetables for the program. This is to be done in close cooperation with the other agencies in the NEHRP, through an interagency committee consisting of the Directors of NSF, NIST, the USGS, and FEMA, and chaired by the Director of the FEMA. The Director of FEMA is to report to Congress on the activities of the NEHRP and recommend to the President how Federal programs could be changed to reduce earthquake hazards. The director of FEMA is also directed to appoint an advisory committee, including representatives from State and local governments, the private sector, the research community, and the general public, to regularly review the NEHRP. The leadership function of the FEMA shall be separate from the operational management of the imple-

mentation aspects of the NEHRP for which the FEMA is responsible.

The Committee wishes to see FEMA's leadership responsibilities given more high-level attention within the agency, and not be secondary to FEMA's intra-agency earthquake program. Furthermore, the Committee anticipates that the new provisions in this section will strengthen interagency coordination and improve FEMA's ability to lead the program effectively.

SECTION 4.—PROGRAM OBJECTIVES

This section amends the objectives subsection of section 5 of the 1977 Act to emphasize the implementation of effective earthquake hazards reduction programs by State and local governments and in the private sector, to highlight the need for basic and applied research on all aspects of earthquake hazards reduction, and to accelerate technology transfer of research results.

SECTION 5.—FEDERAL PARTICIPATION

This section adds the Department of Education to the 1977 Act's list of agencies which may be involved in NEHRP activities. The Department of Education funds facilities construction and therefore should be part of the ICSSC and other multi-agency programs involving earthquake preparedness. In addition, the Department of Education could assist in distributing NEHRP-funded educational materials on earthquakes.

SECTION 6.—RESEARCH

Section 6 amends the research elements subsection of section 5 of the 1977 Act to emphasize applied research. The amendments include provisions to develop ways to combine earthquake hazards reduction measures with other natural and technological hazards reduction measures, to maintain a national data base on seismicity through establishment of a National Seismic Network, and systematically to assess the earthquake risks in seismically active regions of the United States.

The Committee recognizes that research on earthquakes and earthquake engineering forms the foundation of the NEHRP. Earthquake preparedness requires accurate assessments of the frequency of earthquakes and the development of new ways to save lives and prevent earthquake damage to buildings and other facilities.

The Committee supports the USGS's plans to use new seismometer and computer technology to create a National Seismic Network which will provide data on earthquakes throughout the United States. This national network will be tied to local and regional networks which are critical for studies of seismically active areas like California, the New Madrid Seismic Zone, South Carolina, Alaska, and New England.

SECTION 7.—MITIGATION

This section amends the mitigation elements subsection of Section 5 of the 1977 Act. It amends the paragraph on the issuance of earthquake predictions and deletes obsolete language calling for re-

ports which were completed in 1981. This section also adds provisions calling for development of guidelines for land-use management and improved building codes to reduce the damage caused by earthquakes. In addition, the section includes a number of measures to accclerate the adoption of earthquake hazards reduction programs at the State and local level. By June 1, 1993, the President shall adopt seismic design and construction standards, which are to be developed by the ICSSC for new and existing Federal buildings and facilities, and for buildings and facilities involving Federal financial assistance.

In the past 10 years, the agencies in NEHRP have devoted considerable effort to developing and evaluating recommended seismic standards for new and existing buildings and facilities. Several FEMA studies have been done on the costs of seismic design and retrofitting. An executive order has been drafted for adoption of appropirate seismic design and construction standards for Federal buildings and facilities. Under these plans, each Federal agency would be responsible for implementing the standards within their programs.

The Committee is concerned that existing ICSSC guidelines or their equivalents have not been adopted, even though implementing many of the guidelines could save lives without significant costs. The Committee expects standards for new Federal buildings to be adopted by December 31, 1990; standards for existing Federal buildings to be adopted by December 31, 1991; and standards for lifelines and other facilities to be adopted by June 1, 1993. In many cases, the standards for Federal buildings and facilities will be equivalent to those in existing building codes. The Committee understands that it may take up to three years for Federal agencies to begin to implement the standards. Furthermore, the Committee recognizes that retrofitting all the existing Federal buildings that need retrofitting will be a slow process, requiring up to 25 years to complete. However, the Committee believes that the application of seismic safety standards for Federal buildings and facilities is needed in order to ensure that Federal buildings are at least as safe as non-Federal buildings.

SECTION 8.—PUBLIC EDUCATION

This section adds a new subsection on public education to section 5 of the 1977 Act. It calls for expanding efforts to educate the public on earthquake hazards. Regional clearinghouses and cooperative programs with the private sector and universities would be established to disseminate information on earthquake hazards. The Committee believes that adding a new subsection on education emphasizes the need to publicize the research and mitigation efforts that have been and will be funded by NEHRP. If the general public does not understand the long-term threat of earthquakes, they will be unwilling to bear the short-term cost of addressing that threat.

SECTION 9.—PLANNING AND RESPONSE

This section adds a new subsection on planning and response to section 5 of the 1977 Act. It calls for accelerating earthquake planning and preparedness efforts. Emphasis is given to emergency

medical services and search and rescue in the event of an earthquake. The section also calls for expanding the use of advanced computer and telecommunications technology to prepare for and respond to damaging earthquakes.

SECTION 10.—CENTER FOR THE INTERNATIONAL EXCHANGE OF EARTHQUAKE INFORMATION

This section requires the establishment of a Center for the International Exchange of Earthquake Information at the USGS. The Committee believes that such a center would promote the two-way exchange of information on earthquake research and earthquake preparedness between the United States and other countries. The functions of the Center could be carried out by several staff who would be the public information source on work done under the NEHRP. The Center would rely heavily on existing resources of the NEHRP agencies.

SECTION 11.—CONFORMING AMENDMENTS

This section contains several conforming amendments to the 1977 Act which correct references in the bill that refer to other subsections and paragraphs of the bill that have been renumbered. In addition, for clarification, the words "of the Federal Emergency Management Agency" are inserted after the word "Director" in the subsection authorizing funds for FEMA.

ROLLCALL VOTES IN COMMITTEE

In accordance with paragraph (c) of rule XXVI of the Standing Rules of the Senate, the Committee provides the following description of the record votes during its consideration of S. 1062:

At the beginning of the debate on S. 1062, the Committee considered the amendment in the nature of a substitute that included provisions that would make the USGS the lead agency for the NEHRP and give FEMA, the current lead agency, a subordinate role. Senator Inouye offered an amendment that would keep FEMA as the lead agency. On a rollcall vote of 9 yeas and 8 nays as follows, the Inouye amendment was adopted:

YEAS—9	NAYS—8
Mr. Inouye	Mr. Hollings
Mr. Ford	Mr. Gore
Mr. Danforth	Mr. Rockefeller
Mr. Packwood	Mr. Kerry
Mr. Stevens	Mr. Breaux [1]
Mr. Kasten	Mr. Bryan
Mr. McCain [1]	Mr. Robb
Mr. Burns	Mr. Lott
Mr. Gorton [1]	

[1] By proxy.

S. 1062, as amended, was then agreed to by voice vote.

CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, changes in existing law made by the bill, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new material is printed in italic, existing law in which no change is proposed is shown in roman):

EARTHQUAKE HAZARDS REDUCTION ACT OF 1977

Section 2 of that Act

SEC. 2. FINDINGS.

The Congress finds and declares the following:

(1) through (4) * * *

[(5) An operational earthquake prediction system can produce significant social, economic, legal, and political consequences.]

(5) The geological study of active faults and features can reveal how recently and how frequently major earthquakes have occurred on those faults and how much risk they pose. Such long-term seismic risk assessments are needed in virtually every aspect of earthquake hazards management, whether emergency planning, public regulation, detailed building design, insurance rating, or investment decision.

[(6) There is a scientific basis for hypothesizing that major earthquakes may be moderated, in at least some seismic areas, by application of the findings of earthquake control and seismological research.]

(6) The vulnerability of buildings, lifelines, public works, and industrial and emergency facilities can be reduced through proper earthquake resistant design and construction practices. The economy and efficacy of such procedures can be substantially increased through research and development.

(7) Programs and practices of departments and agencies of the United States are important to the communities they serve; some function, such as emergency communications and national defense, and facilities, such as dams, bridges, and public works, must remain in service during and after an earthquake. Federally owned, operated, and influenced structures and facilities should pose hazards to their occupants and to the community that are no greater than those posed to the community by other structures and facilities that are under private, local, or State control or regulation.

[(7)] *(8)* The implementation of earthquake hazards reduction measures would, as an added benefit, also reduce the risk of loss, destruction, and disruption from other natural hazards and man-made hazards, including hurricanes, tornadoes, accidents, explosions, landslides, building and structural cave-ins, and fires.

[(8)] *(9)* Reduction of loss, destruction, and disruption from earthquakes will depend on the actions of individuals, and organizations in the private sector and governmental units at Federal, State, and local levels. The current capability to transfer knowledge and information to these sectors is insufficient. Improved mechanisms are needed to translate existing information and research findings into reasonable and usable specifications, criteria,

and practices so that individuals, organizations, and governmental units may make informed decisions and take appropriate actions.

[(9)] *(10)* Severe earthquakes are a worldwide problem. Since damaging earthquakes occur infrequently in any one nation, international cooperation is desirable for mutual learning from limited experiences.

[(10)] *(11)* An effective Federal program in earthquake hazards reduction will require input from and review by persons outside the Federal Government expert in the sciences of earthquake hazards reduction and in the practical application of earthquake hazards reduction measures.

Section 5 of that Act

SEC. 5. NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM.

(a) ESTABLISHMENT.—The President shall establish and maintain, in accordance with the provisions and policy of this Act a coordinated earthquake hazards reduction program, which shall—

(1) be designed and administered to achieve the objectives set forth in subsection (c);

(2) involve, where appropriate, each of the agencies listed in subsection (d) and the non-Federal participation specified in subsection [h] *(j)* and

(3) include each of the elements described in subsections [(e) and (f) and the assistance to the States specified in subsection (g).] *(e), (f), (g), and (h) and the assistance to the States specified in subsection (i).*

(b) DUTIES.—

(1) * * *

[(2) The Federal Emergency Management Agency (hereinafter referred to as the "Agency") is designated as the agency with the primary responsibilities to plan and coordinate the National Earthquake Hazards Reduction Program. The Director of the Agency (hereinafter referred to as the 'Director') shall—

[(A) recommend to the President the role and responsibility of each appropriate Federal department, agency, and entity with respect to each object and element of the program;

[(B) recommend to the President goals, priorities, budgets, and target dates for implementation of the program;

[(C) provide a method for cooperation and coordination with, and assistance (to the extent of available resources) to, interested governmental entities in all States, particularly those containing areas of high or moderate seismic risk;

[(D) provide for qualified and sufficient staffing for the program and its components;

[(E) compile and maintain a written plan for the program specified in subsections (a), (e), (f), and (g), to be submitted to the Congress and updated at such times as may be required by significant program events, but in no event less frequently than every three years;

[(F) make, in cooperation with the United States Geological Survey, the National Science Foundation, and the National Bureau of Standards, an annual presentation to the appropriate committee of the Congress within sixty days after the end of each fiscal year for the purpose of communicating any events and any programmatic requirements deemed significant by the National Earthquake Hazards Reduction Program; and

[(G) recommend appropriate roles for State and local units of government, individuals, and private organizations.]

(2) The Federal Emergency Management Agency is designated as the agency with the primary responsibilities to plan, coordinate, and lead the National Earthquake Hazards Reduction Program. The Director of the Agency shall—

(A) lead, through the mechanisms outlined in this section, the National Earthquake Hazards Reduction Program;

(B) recommend to the President the role and responsibility of each appropriate Federal department, agency, and entity with respect to each object and element of the program;

(C) recommend to the President goals, priorities, budgets, and target dates for implementation of the program;

(D) establish and chair an interagency committee, whose other members shall be the Directors of the United States Geological Survey, the National Science Foundation, and the National Institute for Standards and Technology, and the heads of such other agencies involved in the program as the Director of the Agency determines appropriate, and which shall meet regularly for the purpose of developing plans, tasks, and milestones, of assuring close cooperation and coordination among the Federal agencies involved in the execution of those plans, and of evaluating the effectiveness of their implementation;

(E) provide a method for cooperation and coordination with, and assistance (to the extent of available resources) to, interested governmental entities in all States, particularly those containing areas of high or moderate seismic risk;

(F) recommend appropriate roles for State and local units of government, individuals, and private organizations;

(G) compile and maintain a written plan for the program specified in subsections (a), (e), (f), (g), (h), and (i) of this section, which shall include specific tasks and milestones for the coming and future years for each agency involved in the program, and which shall be submitted to the Congress as part of the annual report and updated at such times as may be required by significant program events;

(H) utilize other Federal agencies, when and as appropriate, for the conduct of specific program activities;

(I) bring to the attention of the President those proposed Federal programs, regulations, and practices with implications for earthquake hazards reduction and recommend to the President changes that offer improved safety with an

assessment of the implications of these changes on safety and economy;

(J) appoint an advisory committee, which will meet regularly, review program activities, and advise the Director of the Agency of program goals, objectives, plans, and performance and which will have balanced representation from the disciplines and communities at interest including appropriate representatives of State and local governments, the design professions, the research community, business and industry, and the general public;

(K) make, in cooperation with those agencies determined by the Director of the Agency to be appropriate under subparagraph (D) of this paragraph, the United States Geological Survey, the National Science Foundation, and the National Institute for Standards and Technology, an annual presentation to the appropriate committees of the Congress within 60 days after the end of each fiscal year for the purpose of communicating any events and any programmatic requirements determined to be significant by the National Earthquake Hazards Reduction Program; and

(L) to the extent practicable, assure that the process leading to the recommendations to the President on the roles and responsibilities of the Federal departments, agencies, and entities and their relative priorities and budgets for the purposes of the national program are separated from the operational management of those research and implementation aspects of the national program for which the Survey has operational responsibility.

(c) OBJECTIVES.—The objectives of the earthquake hazards reduction program shall include—

(1) the accelerated implementation of effective State and local governmental and private sector programs designed to reduce earthquake hazards through the development of innovative strategies, practical methodologies, and appropriate mechanisms to enhance application of research results and the provision of technical and financial assistance to State and local governments and to the private sector;

[(1)**]** *(2)* the development of technologically and economically feasible design and construction methods and procedures to make new and existing structures, in areas of seismic risk, earthquake resistant, giving priority to the development of such methods and procedures for nuclear power generating plants, dams, hospitals, schools, public utilities, public safety structures, high occupancy buildings, and other structures which are especially needed in time of disaster;

[(2)**]** *(3)* the implementation in all areas of high or moderate seismic risk, of a system (including personnel, technology, and procedures) for predicting damaging earthquakes and for identifying, evaluating, and accurately characterizing seismic hazards;

[(3)**]** *(4)* the development, publication, and promotion, in conjunction with State and local officials and professional organizations, of model codes and other means to coordinate infor-

mation about seismic risk with land-use policy decisions and building activity;

[(4)] *(5)* the development, in areas of seismic risk, of improved understanding of, and capability with respect to, earthquake-related issues, including methods of controlling the risks from earthquakes, planning to prevent such risks, disseminating warnings of earthquakes, organizing emergency services, and planning for reconstruction and redevelopment after an earthquake;

[(5)] *(6)* the education of the public, including State and local officials, as to earthquake phenomena, the identification of locations and structures which are especially susceptible to earthquake damage, ways to reduce the adverse consequences of an earthquake, and related matters;

[(6)] *(7)* the development of research on—

(A) ways to increase the use of existing scientific and engineering knowledge to mitigate earthquake hazards;

(B) the social, economic, legal, and political consequences of eathquake prediction; and

(C) ways to assure the availability of earthquake insurance or some functional substitute; [and]

[(7)] *(8)* the development of basic and applied research leading to a better understanding of the control or alteration of seismic phenomena[.]*;*

(9) the performance of basic and applied research on all aspects of earthquake hazards reduction (including mitigation, prediction, hazard identification, insurance, preparedness, response, recovery, and utilization of developed knowledge and information); and

(10) the development of innovative approaches and means to accelerate technology transfer so that the results of scientific research can be effectively utilized in the development of earthquake hazards reduction measures through State and local governments and the private sector.

(d) PARTICIPATION.—In assigning the role and responsibility of Federal departments, agencies, and entities under subsection (b)(1)(A), the President shall, where appropriate, include the United States Geological Survey, the National Science Foundation, the Department of Defense, the Department of Housing and Urban Development, *Department of Education,* the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration, the Department of Commerce, the Energy Research and Development Administration, the Nuclear Regulatory Commission, and the Federal Emergency Management Agency.

(e) RESEARCH ELEMENTS.—The research elements of the program, *which shall consist of basic and applied research,* shall include—

(1) through (7) * * *

(8) exploration of possible social and economic adjustments that could be made to reduce earthquake vulnerability and to exploit effectively existing and developing earthquake mitigation techniques; [and]

(9) studies of foreign experience with all aspects of earthquakes. *;*

(10) development of approaches to combine measures for earthquake hazards reduction with measures for reduction of other natural and technological hazards;

(11) maintenance of an appropriate data base of earthquake occurrence throughout the Nation through the operation of a National Seismic Network, which shall complement and support existing university-based regional seismic networks; and

(12) systemic assessment of each of those regions of the Nation believed to be prone to earthquakes (including the development of an understanding of the geological origin of the earthquakes); reliable estimation of the size, frequency, and probability of the expected earthquakes; determination of the character of the resulting strong ground motion and the area affected; estimation of the potential for surface fault rupture, ground distortion, liquefaction, landsliding, elevation change, and ground motion amplification and other effects; and making the products of the assessment available in forms useful for mitigation actions (including actions relating to land use, engineering design, insurance, emergency planning, and construction standards, practices, and codes).

(f) MITIGATION ELEMENTS.—The mitigation elements of the program shall provide for—

[(1) ISSUANCE OF EARTHQUAKE PREDICTIONS.—The Director of the United States Geological Survey is hereby given the authority, after notification of the Director, to issue an earthquake prediction or other earthquake advisory as he deems necessary. For the purposes of evaluating a prediction, the National Earthquake Prediction Evaluation Council shall be exempt from the requirements of section 10(a)(2) of the Federal Advisory Committee Act. The Director shall have responsibility to provide State and local officials and residents of an area for which a prediction has been made with recommendations of actions to be taken;]

(1) the issuance by the Director of the United States Geological Survey of earthquake predictions or other earthquake advisories as the Director of the Survey determines necessary, in connection with which—

(A) the Director of the Federal Emergency Management Agency shall be notified as soon as possible, in advance of public release if practicable;

(B) for purposes of evaluating a prediction, the National Earthquake Prediction Evaluation Council shall be exempt from the requirements of section 10(a)(2) of the Federal Advisory Committee Act; and

(C) the Director of the Federal Emergency Management Agency shall have responsibility to provide State and local officials and residents of an area for which a prediction has been made with recommendations of actions to be taken;

(2) the development of ways for State, county, local, and regional governmental units to use existing and developing

knowledge about the regional and local variations of seismic risk in making their land use decisions;

[(3) the development and promulgation of specifications, building standards, design criteria, and construction practices to achieve appropriate earthquake resistance for new and existing structures;]

(3) the development of guidelines for land-use management, and the provision of them to local legislatures and land-use planners, along with the basis for their adoption;

(4) the development and promulgation of specifications, building codes, and standards of practice for design, construction, and retrofitting to achieve appropriate earthquake resistance for new and existing structures and lifelines;

[(4)] *(5)* an examination of alternative provisions and requirements for reducing earthquake hazards through Federal and federally financed construction, loans, loan guarantees, and licensees;

[(5)] *(6)* the determination of the appropriate role for insurance, loan programs, and public and private relief efforts in moderating the impact of earthquakes;

[(6)] *(7)* dissemination, on a timely basis, of—

(A) instrument-derived data of interest to other researchers;

(B) design and analysis data and procedures of interest to the design professions and to the construction industry; and

(C) other information and knowledge of interest to the public to reduce vulnerability to earthquake hazards;

[(7) transmittal to Congress by the Director of an intra-agency coordination plan for earthquake hazard mitigation and response within thirty days after enactment of this paragraph [enacted Oct. 19, 1980], which plan shall coordinate all of the directorates of the agency; and

[(8) the development and implementation by the Director of a preparedness plan for response to earthquake predictions which includes the following items:

[(A) A prototype plan to be in place in one major metropolitan area by September 30, 1981.

[(B) An action plan to be completed for specific adaptations of the prototype plan to other high risk metropolitan areas by September 30, 1981.

[(C) These prediction response plans are to be integrated with prerparedness response plans.

[(D) The plans shall include coordinaton with State and local governmental companion efforts.

[(E) The plans shall be updated as new, relevant information becomes available.]

(8) the identification of social, legal, and economic factors that influence or motivate the public and private sector entities to adopt earthquake hazard mitigation policies and programs;

(9) the definition of the costs and benefits of earthquake hazard mitigation programs to the public and private sector entities;

(10) the development of a systematic program for loss estimation for high-risk areas;

(11) the implementation and administration of training programs consisting of workshops and seminars for State, local, and private sector emergency planners, responders, and officials in earthquake planning, mitigation, response, and recovery measures;

(12) the implementation of an education program for State and local officials responsible for seismic code adoption and enforcement;

(13) the adoption of seismic design and construction standards, which shall be developed by the Interagency Committee on Seismic Safety in Construction and which shall be adopted by the President not later than June 1, 1993, for new and existing Federal buildings and facilities and for buildings and facilities involving Federal domestic assistance (including grants, loans, and mortgage insurance), leasing, and regulatory programs; and

(14) the development and implementation of preparedness plans (for response to earthquake predictions for areas specified by the Director of the United States Geological Survey), which shall be carried out by the Director of the Federal Emergency Management Agency so as to assure that such plans are integrated with long term preparedness response plans, are coordinated with State and local government efforts, and are reviewed and revised as necessary as new and relevant information becomes available.

(g) EDUCATION OF THE PUBLIC.—The public education elements of the program shall provide for—

(1) examining the levels of understanding about hazard prediction probabilities among the public and media, and evaluating how their perceptions may affect behavior;

(2) developing a comprehensive education and awareness program to inform the public regarding the existence of earthquake hazards and the ways the public can help to reduce such hazards;

(3) establishing regional clearinghouses to provide information and technical assistance through the publication of information in the form of pamphlets, newsletters, and issue papers; and

(4) implementing cooperative programs between the private sector and universities, governmental bodies, and regulatory groups to disseminate earthquake information to the public, including the possible establishment of university earthquake centers as a means for educating the public about earthquake hazards and for transferring to the design and construction professions, industry and business, preparedness officials, and the public the technologies developed for earthquake hazards reduction and preparedness.

(h) EARTHQUAKE PLANNING AND RESPONSE.—The earthquake planning and response elements of the program shall provide for—

(1) accelerating the development, publication, and distribution of postulated earthquake scenarios for various events in risk areas throughout the United States;

(2) expanding the use of advanced information technologies, including computers, telecommunications, and audio and video devices, in defining and mitigating earthquake risks, preparing emergency response plans, and responding to and recovering from damaging earthquakes;

(3) expanding the planning and information transfer capabilities of existing regional earthquake preparedness projects and consortia;

(4) creating and maintaining additional regional earthquake preparedness planning and earthquake education efforts in each high-risk area of the United States, including the development and implementation by the Director of the Federal Emergency Management Agency of a program to enhance local government involvement in such regional efforts;

(5) increasing the ability of State and local governments to conduct earthquake planning and preparedness efforts;

(6) determining the adequacy of health and social services to meet the disaster needs of the populace in areas of high seismic risk;

(7) evaluating the role of the National Disaster Medical Service in earthquake response and rescue planning;

(8) determining the adequacy of available search and rescue personnel and equipment in areas of high seismic risk and developing a plan to supplement such resouces where necessary;

(9) developing a national emergency response plan for each area of high seismic risk; and

(10) defining the nature and extent to which disaster planning is currently being carried out in the private sector to ensure that public and private plans are compatible.

[(g)] *(i)* STATE ASSISTANCE.—In making assistance available to the States under the Disaster Relief and Emergency Assistance Act (42 U.S.C. 5121 et seq.), the President may make such assistance available to further the purposes of this Act, including making available to the States the results of research and other activities conducted under this Act.

[(h)] *(j)* PARTICIPATION.—In carrying out the provisions of this section, the President shall provide an opportunity for participation by the appropriate representatives of State and local governments, and by the public, including representatives of business and industry, the design professions, and the research community, in the formulation and implementation of the program.

Such non-Federal participation shall include periodic review of the program plan, considered in its entirety, by an assembled and adequately staffed group of such representatives. Any comments on the program upon which such group agrees shall be reported to the Congress.

Measures developed pursuant to paragraph 5(f)(1) for the evaluation of prediction techniques and actual predictions of earthquakes shall provide for adequate non-Federal participation. To the extent that such measures include evaluation by Federal employees of non-Federal prediction activities, such measures shall also include evaluation by persons not in full-time Federal employment of Federal prediction activities.

[(i) STUDY.—Within one year after the date of enactment of this subsection, the Director shall conduct a study and prepare and transmit recommendations to Congress to amend the Disaster Relief and Emergency Assistance Act (42 U.S.C. 5121, et seq.) to include provisions for funding for the period of time following a validated earthquake prediction.]

[(j)] *(k)* COST SHARING.—(1) In the case of any State which has voluntarily engaged in cost sharing by matching Federal grants from the Federal Emergency Management Agency for activities under this Act over the three-fiscal-year period ending September 30, 1987, any such cost sharing that may be required for the fiscal year ending September 30, 1988, or the fiscal year ending September 30, 1989, shall be at a level no higher that the State's average level of such cost sharing over such three-year period.

(2) In the case of any State which has not engaged in cost sharing by matching Federal grants from the Federal Emergency Management Agency for activities under this Act over such three-fiscal-year period—

(A) no such cost sharing may be required for the fiscal year ending September 30, 1988; and

(B) any such cost sharing that may be required for the fiscal year ending September 30, 1989, shall be at a level no higher than 25 percent of the cost of the activities involved.

(3) Nothing in this subsection shall be construed to prevent a State, voluntarily and at its option, from engaging in cost sharing at a level higher than the maximum level which may be required of it under paragraph (1) or (2).

(l) CENTER FOR INTERNATIONAL EXCHANGE OF EARTHQUAKE INFORMATION.—A Center for the International Exchange of Earthquake Information shall be established within the United States Geological Survey which shall—

(1) promote the exchange of information on earthquake research and earthquake preparedness between the United States and other nations;

(2) maintain a library containing reports, research papers, and data produced through the National Earthquake Hazards Reduction Program;

(3) answer requests from other nations for information on United States earthquake research and earthquake preparedness programs; and

(4) direct foreign requests to the agency involved in the National Earthquake Hazards Reduction Program which is best able to respond to the request.

SEC. 6. ANNUAL REPORT.

The President shall, within ninety days after the end of each fiscal year, submit an annual report to the appropriate authorizing committees in the Congress describing the status of the program, and describing and evaluating progress achieved during the preceding fiscal year in reducing the risks of earthquake hazards. Each such report shall include a copy of the program plan described in [section 5(b)(2)(E)] *section 5(b)(2)(G)* and any recommendations for legislation and other action the President deems necessary and appropriate.

SEC. 7. AUTHORIZATION OF APPROPRIATIONS.

(a) GENERAL.—(1) There are authorized to be appropriated to the President to carry out the provisions of sections 5 and 6 of this Act (in addition to any authorizations for similar purposes included in other Acts and the authorizations set forth in subsections (b) and (c) of this section), not to exceed $1,000,000 for the fiscal year ending September 30, 1978, not to exceed $2,000,000 for the fiscal year ending September 30, 1979, and not to exceed $2,000,000 for the fiscal year ending September 30, 1980.

(2) There are authorized to be appropriated to the Director *of the Federal Emergency Management Agency* to carry out the provisions of sections 5 and 6 of this Act for the fiscal year ending September 30, 1981—

(A) $1,000,000 for continuation of the Interagency Committee on Seismic Safety in Construction and the Building Seismic Safety Council programs.

(B) $1,500,000 for plans and preparedness for earthquake disasters,

(C) $500,000 for prediction response planning,

(D) $600,000 for architectural and engineering planning and practice programs,

(E) $1,000,000 for development and application of a public education program,

(F) $3,000,000 for use by the National Science Foundation in addition to the amount authorized to be appropriated under subsection (c), which amount includes $2,400,000 for earthquake policy research and $600,000 for the strong ground motion element of the siting program, and

(G) $1,000,000 for use by the Center for Building Technology, National Bureau of Standards in addition to the amount authorized to be appropriated under subsection (d) for earthquake activities in the Center.

(3) There are authorized to be appropriated to the Director *of the Federal Emergency Management Agency* for the fiscal year ending September 30, 1982, $2,000,000 to carry out the provisions of sections 5 and 6 of this Act.

(4) There are authorized to be appropriated to the Director *of the Federal Emergency Management Agency* to carry out the provisions of sections 5 and 6 of this Act, $1,281,000 for the fiscal year ending September 30, 1983.

(5) There are authorized to be appropriated to the Director *of the Federal Emergency Management Agency* to carry out the provisions of sections 5 and 6 of this Act, for the fiscal year ending September 30, 1984, $3,705,000 and for the fiscal year ending September 30, 1985, $6,096,000.

(6) There are authorized to be appropriated to the Director *of the Federal Emergency Management Agency* to carry out the provisions of sections 5 and 6 of this Act for the fiscal year ending September 30, 1986, $5,596,000, and for the fiscal year ending September 30, 1987, $5,848,000.

(7) There are authorized to be appropriated to the Director *of the Federal Emergency Management Agency* to carry out the provisions of sections 5 and 6 of this Act $5,778,000 for the fiscal year ending September 30, 1988, $5,788,000 for the fiscal year ending September

30, 1989, and $5,798,000 for the fiscal year ending September 30, 1990.

(b) through (e) * * *

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